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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,526	07/25/2003	Ichiro Hase	SON-2790	1107
23353	7590	11/24/2004	EXAMINER	
RADER FISHMAN & GRAUER PLLC LION BUILDING 1233 20TH STREET N.W., SUITE 501 WASHINGTON, DC 20036			SMOOT, STEPHEN W	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/626,526

Applicant(s)

HASE, ICHIRO

Examiner

Stephen W. Smoot

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*ps*

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment: See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 5 is/are rejected.
- 7) ☒ Claim(s) 2-4, 6 and 7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

This Office action is in response to application papers filed on 25 July 2003.

### *Drawings*

1. Figs. 7-8 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (see page 2, lines 20-21, page 3, lines 7-8, and page 10, lines 10-13). Also see MPEP § 608.02(g).

Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to because reference number 28 in Fig. 6 is designated as a p<sup>+</sup>-GaAsBiN layer in the drawing, but described as a p<sup>+</sup>-GaAsBi layer in the specification (see page 16, lines 15-16).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Heterojunction Bipolar Transistor with a Base Layer that Contains Bismuth.

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4. The disclosure is objected to because of the following informalities:

On page 13, line 6, change "lager" to --larger-- to correct spelling; and

The drawings appear to be mislabeled as follows:

The first embodiment, which refers to Fig. 1, appears to actually be describing Fig. 2;

The second embodiment, which refers to Fig. 2, appears to actually be describing Fig. 3;

The third embodiment, which refers to Fig. 3, appears to actually be describing Fig. 4;

The fourth embodiment, which refers to Fig. 4, appears to actually be describing Fig. 5;

The fifth embodiment, which refers to Fig. 5, appears to actually be describing Fig. 6;

The sixth embodiment, which refers to Fig. 6, appears to actually be describing Fig. 7;

The conventional GaAs-based HBT described in paragraph [0005], which refers to Fig. 7, appears to actually be describing Fig. 8; and

The conventional InP-based HBT described in paragraph [0006], which refers to Fig. 8, appears to actually be describing Fig. 1.

Appropriate correction is required.

***Claim Objections***

5. Claim 6 is objected to because of the following informality:

In claim 6, line 3, change "Inp" to --InP-- to properly represent indium phosphide.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 5 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites the limitation "the emitter side" in line 3; and

Claim 5 recites the limitation "the collector side" in line 3.

There is insufficient antecedent basis for these limitations in claim 5.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Heremans et al. (US 4,847,666).

Referring to Figs. 1, 2 and column 5, line 10 to column 7, line 31, Heremans et al. disclose a ballistic transistor (10) that includes an emitter (12), a base (14), and a collector (18). The base (14) is  $n^+$  type PbTe and the n-type doping is preferably achieved by adding bismuth (see column 6, lines 4-5, 26-30). The emitter (12) contains europium and consequently has a wider band gap than the base (14) (see column 6, lines 1, 19-22 and Fig. 2).

These are all of the limitations set forth in claim 1 of the applicant's invention.

***Allowable Subject Matter***

10. Claims 2-4, 6-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of claim 1 and if claim 6 was amended to overcome the above objection.

11. The following is a statement of reasons for the indication of allowable subject matter:

- Claims 2-4 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a semiconductor device with an emitter layer, a base layer, and a collector layer, wherein the base layer contains GaAsBi (claim 2), GaAsBiN (claim 3), or InPBi (claim 4);
- Claim 6 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a semiconductor device with an emitter layer, a base layer, and a collector layer, wherein the emitter layer includes at least one selected from the group consisting of GaAs, AlGaAs, InGaP, and InP; and
- Claim 7 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a semiconductor device with an emitter layer, a base layer, and a collector layer, wherein the collector



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layer includes at least one selected from the group consisting of GaAs, InGaAs, and InP.

### ***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jerome et al. and Richardson et al. teach bipolar transistors that may include bismuth as an n-type dopant. Kobayashi teaches a heterojunction bipolar transistor that can include an emitter with a bismuth-doped InGaP layer.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

Stephen W. Smoot  
Patent Examiner  
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